

Prediction of Consciousness Level and it's Correlation with Healthcare Worker Performance Fuzzy Model: Scientific Experimental Study

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Abstract—Consciousness is nothing it is the only measurement of personality trait that correlates with performance of every category which is based on perceptions, thoughts and awareness. Consciousness affects the physical, mental and spiritual performance of the person in consequence affects the environment of the workplace. The Performance of the person at workplace is correlated with the level of Consciousness. The Present study is determining the performance of Health care worker through level of consciousness in an organization. The consciousness will be experimentally measured using the self developed sensor and virtual instrumentation which is the psychological measurement. The Health Care worker performance will be determined by survey method. Data collected from 22 workers in an organization “Puspanjali Hospital & Research centre” indicated that consciousness was related to job performance. The Statistical analysis and relationship will be established between Healthcare workers performance and consciousness. Finally fuzzy dynamical model is developed in which labeled concepts and precepts are altered as a function of context and conditions, and these changes occur continuously in time.

Keywords—Consciousness, energy, chakras, workplace performance, quality of care, fuzzy dynamical model

INTRODUCTION

Consciousness has become a notable topic of research in psychology and neuroscience. Consciousness is the state of being aware of environment or something within oneself. It can be explained as subjectivity, awareness, sentience, the ability to feel or to experience, wakefulness and having the sense of selfhood. Meditation practices are also likely to affect physiological pathways, including immune and neuroendocrine system. Consciousness affects the Chakra energy of the human being. The chakras are manifestations of consciousness. Each chakra represents a particular level of consciousness taking care of a particular area of the body. Psychologist explain that consciousness of a person can be quantized by measuring the physiological response of consciousness e.g. electrical activities of brain EEG/MEG, Magnetic

flux, Human aura, Brain Mapping, cognitive approach chakra energy etc. Here we have used the method of measuring consciousness by measurement of energy at different energy centers of human body.

Consciousness also greatly affects performance of human being. Performance is a significant criterion that relates to organizational success. Performance rating is the step in the work in which the analyst observes the Health care worker's performance and records a value representing that performance relative to the analyst's concept of standard performance.

There are many complex systems for which artificial neural net-work and fuzzy logic have been proposed. The ANN requires massive amount of training data and the ability of self learning and non-linear approximations, but it lacks the inference common in human beings. On the other hand fuzzy logic can solve uncertainty, but fuzzy system is largely dependent on the knowledge and experiences of experts and operators. This paper shows to modeling of the observed data is done using fuzzy logic and it's Fuzzy dynamical model of consciousness is developed which is an effective tool for the approximation of uncertain nonlinear dynamic systems on the basis of measured input-output data, fuzzy rule base, membership function. Finally it shows that how fuzzy sets show to represent a real system or process.

METHODOLOGY

The Present experimental study was conducted on the Health care worker which shows that if they will perform better then it leads to good outcomes in terms of professional taking care of patients with critical illness service etc. There are several methods of performance rating. The simplest and most common method is based on Care of quality and emotional demands. Standard performance rating is denoted as 10. A performance rating 10 means the Health care worker's performance is perfect according to need of Medical care, and less than 10 means the Health care worker's performance is less than standard. Statistical analysis between the Performance rating and level of consciousness on different energy centre of body is to be determined. The principal is used in Energy Measurement System to

measure the energy which is based on the existence of 24 meridians and 365 acupressure points on the limbs. The status of organs depends on the balance between the meridian's energy. Energy Measurement System designed using self made Sensor to measures the energy level of human at different energy centers (chakras) of the human body which is directly related to the consciousness level of a person. These measured data of energy levels at different centers is given to fuzzifier as input. In fuzzification process a real value changes into fuzzy value which is called linguistic value. The measured energy levels are to be expressed in terms of linguistic variable as input given to inference engine. for fuzzified input the functions triangular is used. In a fuzzy logic a rule base which is simple IF-THEN rule with a condition and conclusion is constructed to control the output linguistic variable as consciousness level of person. This output variable as level of consciousness is given to defuzzifier convert the fuzzy output value into particular conclusion in other world, real value.

FUZZY STRUCTURE

The Fuzzy consciousness model (FCM) is works on the basic principal of fuzzy logic which is a method of processing data by allowing partial set membership instead of non membership shows the Non Linear mapping of an input data set to a scalar output data. Fuzzy set concepts of FCM define collection of elements without a crisp or a clearly defined boundary distinguishing member and non member. In this present paper shows architecture of fuzzy consciousness model is based on the fuzzy logic algorithm shown in Table 1.

Fuzzy expert system consist of four main parts mainly

- Fuzzification Module
- Fuzzy Rule Base
- Inference engine
- Defuzzification Module

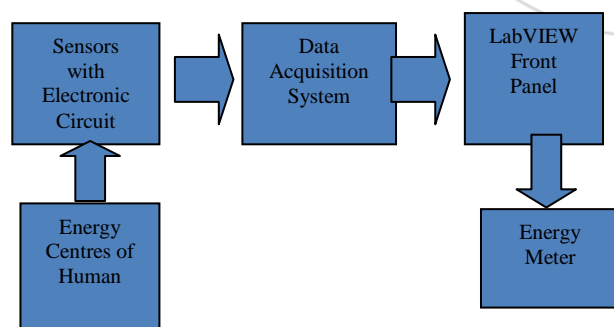


Fig. 1: Block diagram of proposed system.

Table 1: Fuzzy logic algorithm for consciousness measurement system.

Fuzzy Logic Algorithm	
1.	Define Linguistic Variable and terms
2.	Construct the membership function
3.	Construct the rule base
4.	Convert the crisp data to fuzzy value using the membership function
5.	Evaluate the rule in rule base
6.	Combine the result of each rule
7.	Convert the output data to non fuzzy value

Experimental setup for measuring the energy level

The Sensor shown in Figure 2 will measure the Energy Level at different energy centers of the body, which is developed in electrical engineering dept of Faculty of Engineering, D.E.I. Dayalbagh, Agra. The sensor contains a copper electrode that applied at the energy centre and a reference terminal, that is fixed onto left palm of a body. The constant voltage source of 9v is connected in series with a suitable resistance so that maximum current flow through the body could be limited. When we switch on the setup, a microampere current is flows through different channels to palm, which measures the chakra energy of a person. Past experiments have shown that Energy is directly related to consciousness. Hence, the study is pertaining to the difference in chakra energy before and after work in the industry and the worker performance.

Sensor is connected to computer via DAQ card and LabVIEW has been used as software tool to measure the energy obtained from consciousness of a person. The Sensor has been connected to NI 6216 DAQ card which converts analog signals to digital signals (ADC) and this card is further connected to computer via USB. NI MAX (National Instrumentation- Measurement and Automation Explorer) has been used. This Device is also called Meridian Energy Analysis Devices.

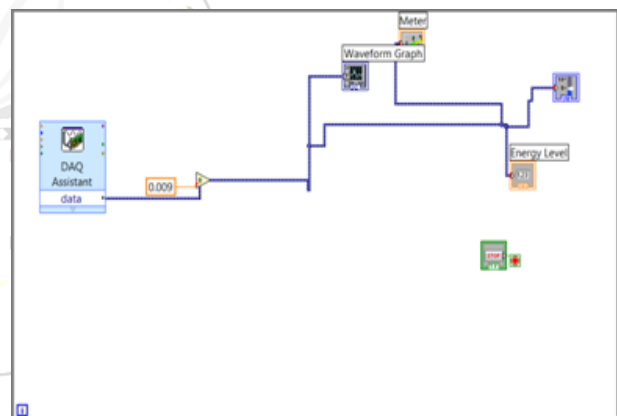


Fig. 2: Interface file for M.E.A.D device.

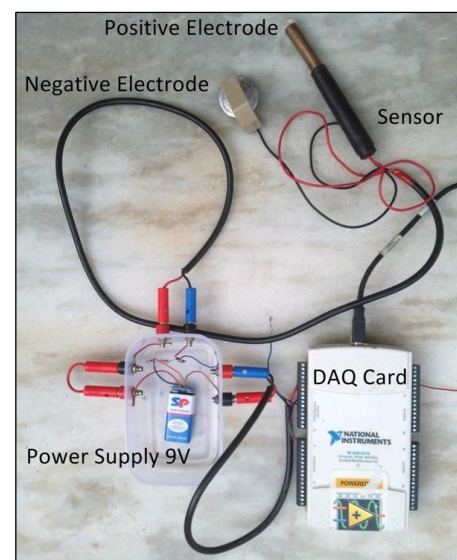


Fig. 3: Experimental setup for measurement of energy.

The main purpose is of this device is to show the customer how circumstances change in the body provides analysis information on body energy, mental and emotional states and automatic nerve balance metabolism. Aside from Tiwan where more than 80% hospital use M.E.A.D. system. The central govt. of china became a new addition to the ever-growing users after evaluating 40 company a span of 19 months their team consisting a group of engineers, scientist, TCM doctors and Healthcare professional Voted the M.E.A.D.

EXPERIMENTAL RESULTS

The energy level is measured at the centre of the line between the two eyes (Eye Centre), throat centre, and the Heart Centre of the Human using Meridian Energy Analysis System (MEAS). The probe was placed at the eye, throat and heart centres. Subsequent readings were taken and statistical analysis shows that mean value of energy (overall group Energy) increase at all three centre and standard deviation (particular band energy after

work) is decrease because it depends on unidirectional concentration level (Focus mental activity) which is to be mostly increase after the work. The correlation Coefficient is also strongly positive between the eye centre energy and performance rating of the Healthcare worker. A fuzzy set is a collection of elements without a crisp or a clearly defined boundary distinguishing members and non members.

Fuzzy Model of Consciousness

A Fuzzy consciousness model has a fuzzy inference kernel and a knowledge-base that includes the information given by fuzzy rule, a fuzzification interface, which has the effect of transforming crisp data into fuzzy sets, an inference system, that uses them together with the knowledge base to make inference by means of reasoning method. The fuzzy inference kernel is executed periodically to determine model output based on current model input. The knowledge base contains membership functions and rules.

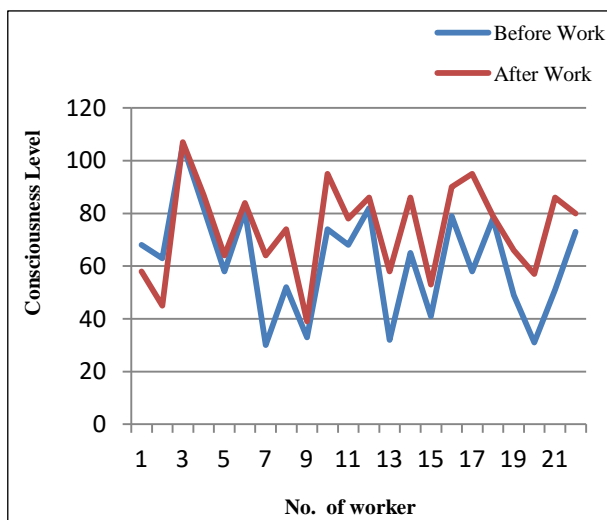


Fig. 4: Comparison of consciousness before and after work.

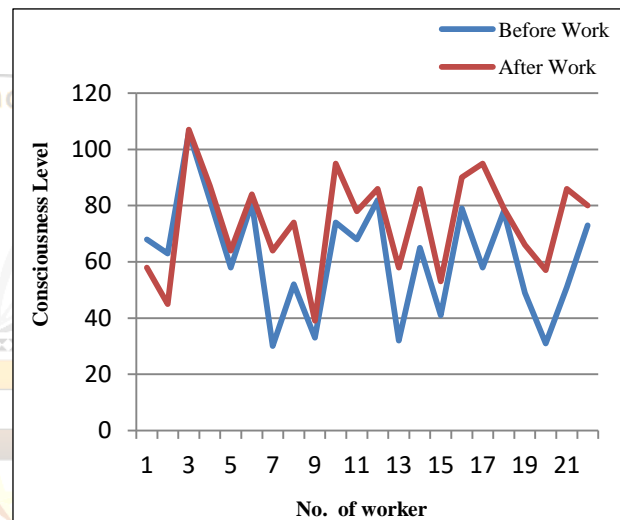


Fig. 5: Comparison of consciousness before and after work.

Table 2: Statistical analysis.

Factors	Energy Before work	Energy After work	Difference of Energies before and after work
Mean At Eye Centre	91.90909	103.5455	11.63636
Standard Deviation At Eye centre	20.10427	14.21846	16.70057
Mean at Throat Centre	61.54545	74.13636	12.59091
Standard Deviation At Throat Centre	20.20544	17.69664	14.19476
Mean At Heart Centre	50.55461	57.15640	10.23415
Standard Deviation At Heart centre	19.55471	16.35421	13.24521

Table 3: Correaltion factors.

Factors	Energy Difference at Eye Center	Energy Difference at Throat center	Energy Difference at Heart center	Performance Rating
Age(yrs)	.10	.04	.06	.10
Height(ft)	.44	.02	.04	.22
Weight(kg)	.44	.10	.19	.35
Experience (yrs)	.39	.30	.41	.53
Energy Difference at Eye Center	1	.48	.60	.82
Energy Difference at Throat center	.48	1	.67	.54
Energy Difference at Heart center	.55	.59	1	.50
Performance	.82	.54	.52	1

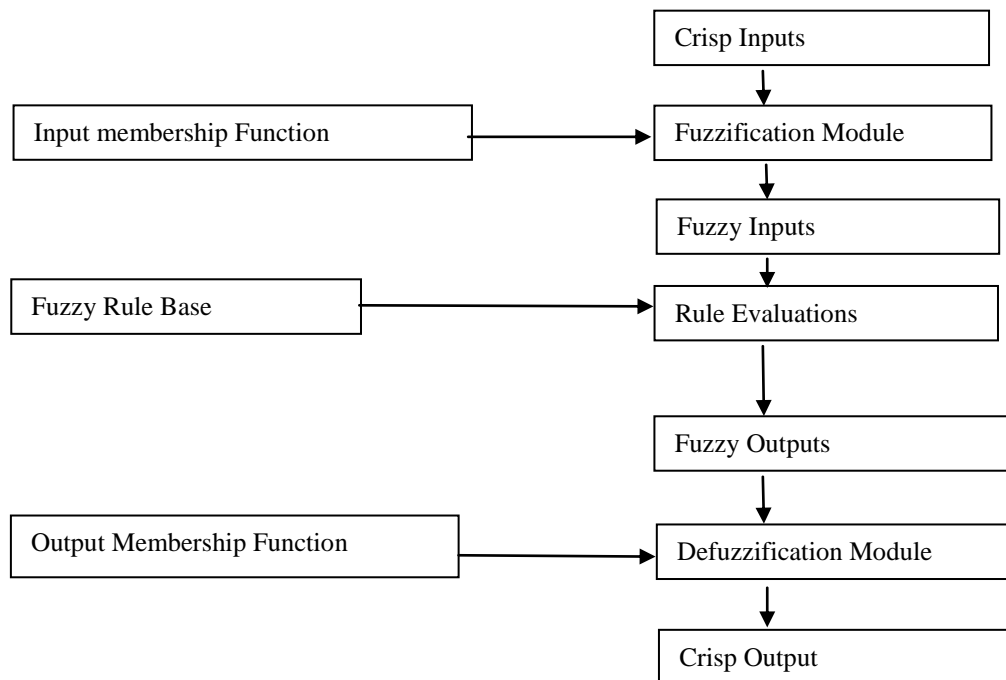


Fig. 6: Block diagram of fuzzy logic system.

FUZZIFICATION

In the fuzzification process, crisp value translate into fuzzy value this possible is called linguistic value. In this experiment Hardware such as Digital energy meter generates crisp data which is converted into linguistic value. The input linguistic value is given to Fuzzification module. For Fuzzified input two triangular functions is used. To determine the range of fuzzy variables according to the crisp input is the primary requirement for proper running of the fuzzier program. The following fuzzy sets are used:

EE=Energy at Eye Centre, ET=Energy at Throat Centre, EH= Energy at Heart Centre

Range for input linguistic variable

S.No.	Crisp Input Range	Fuzzy Variable Name
1.	30 to 150	EE
2.	30 to 140	ET
3.	30 to 120	EH

The value for each input variable is applied to the set of rules. The antecedent of each rule is computed to obtain a single number called support of the rule. When a rule has a degree zero, this rule does not apply. If the degree says that the rule has fired, i.e. the rule is Inference: Consists of two parts: implicit aggregation. On implication, the value from the degree of support is applied to the consequence results in assigning for each rule a fuzzy aggregation part, the fuzzy sets obtained fr are combined to obtain a single fuzzy set variable.

Fuzzy theory describe realistic problems by allowing elements to belong, and to not belong to a group or set at the same time The two most important concepts of fuzzy theory are the fuzzy set and the membership function. These two concepts are similar and are used interchangeably. A fuzzy set is a collection of elements without a crisp or a clearly defined boundary

distinguishing members and non members. The membership function, on the other hand, is that function which indicates the degree of membership of an element to a set, the fuzzy set. The shape of the membership functions is nonlinear. A fuzzy system consists of four parts.

Membership Function

A membership function (MF) evaluates the non fuzzy input values to fuzzy linguistic terms and vice-versa. For instance, membership functions for the linguistic terms of Energy label are plotted. Present study considered typically three input variable and one output variable. It is essential to attribute Fuzzy membership to related variable, this curve defines how each point in the input space is mapped to a membership value (or degree of membership) between 0 and 1. The Fuzzy Sets used for each input and output variable are as follows: H=High and L=Low

The Triangular Functions for each fuzzy sets is defined by a lower limit a , an upper limit b , and a value m where $a < m < b$ (figure 7).

The membership functions used for this system are now defined for each input and for the output. The functions for each can be seen in the following images. The Energy at eye centre (EE) input variable will be in the range of 30 to 150, the energy at throat variable centre(ET) input will be in the range of 30 to 140 and the energy at heart centre(EH) input will be 30 to 120 while the Consciousness level output variable will be in the range of 30 to 150. There are two triangular shaped type membership function(Low and High) for each input variable which are Energy at Eye centre (EE), Energy at Throat centre (ET) and Energy at Heart centre (EH) and output variable has also two triangular shaped type membership function (Low and High).

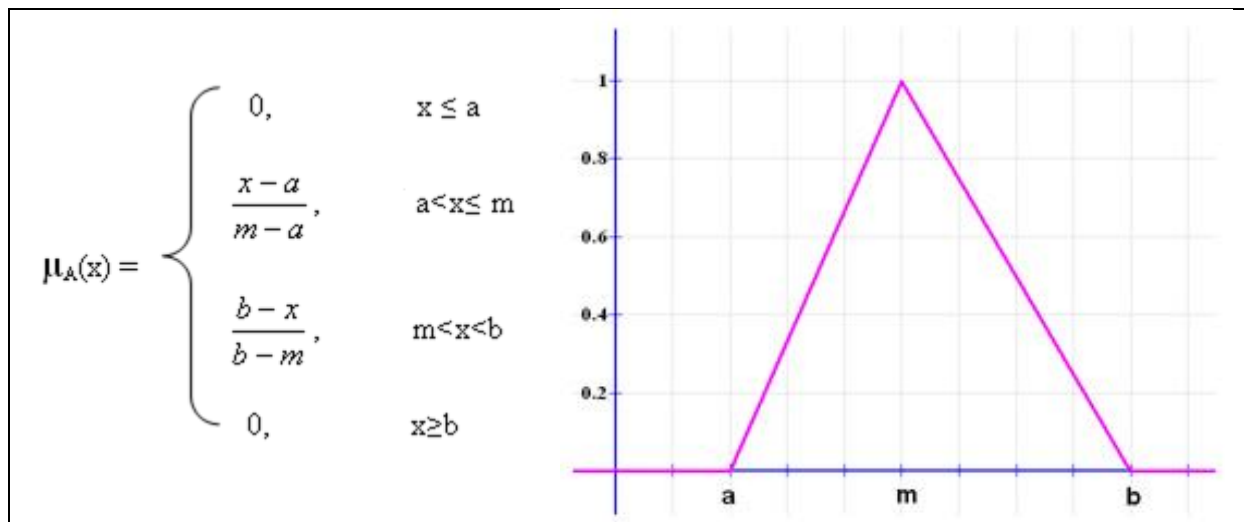


Fig. 7: Membership function of the system.

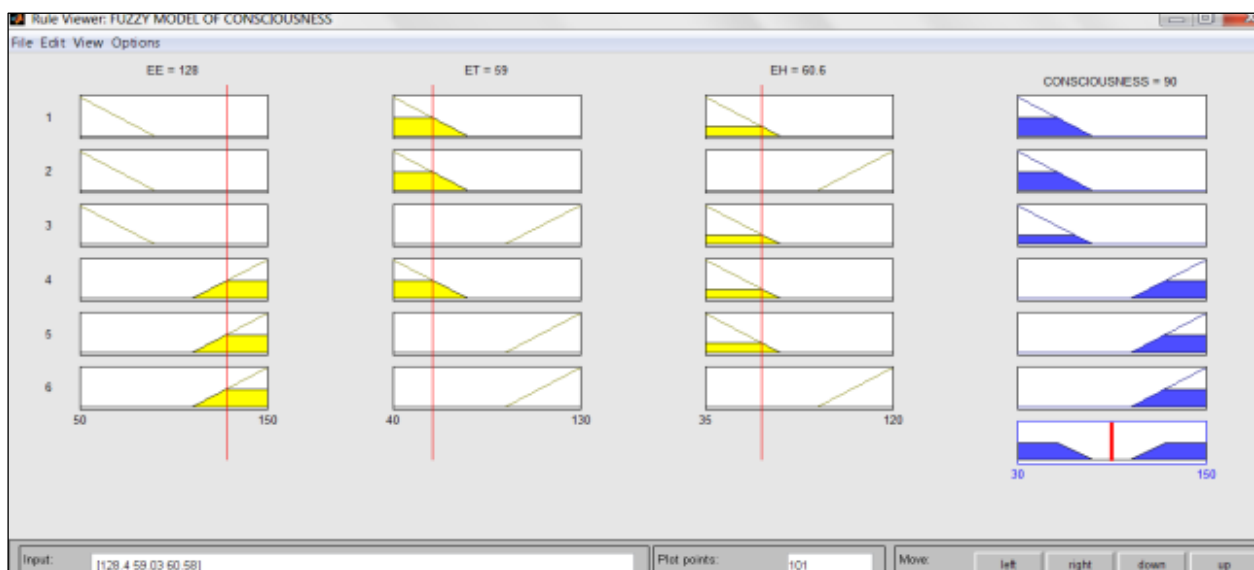


Fig. 8: Rule of the system.

Fuzzy Rule Base

The restraint policy of a fuzzy Consciousness model is comprised by the rule base. Each rule has an antecedent (If part of the rule) depicts the situation for which the rule is projected. The following consequent part (then part of the rule) delineates the reaction of the fuzzy system in this state.

There are fuzzy rule on which the level of consciousness (fuzzy) is depends.

S.No.	Fuzzy Rules
1.	If (EE is Low) OR (ET is Low) OR (EH IS Low) then Consciousness is Low.
2.	If (EE is Low) OR (ET is Low) OR (EH IS High) then Consciousness is Low.
3.	If (EE is Low) OR (ET is High) OR (EH IS Low) then Consciousness is Low.
4.	If (EE is High) OR (ET is Low) OR (EH IS Low) then Consciousness is High.
5.	If (EE is High) OR (ET is High) OR (EH IS Low) then Consciousness is High.
6.	If (EE is High) OR (ET is High) OR (EH IS High) then Consciousness is High.

Defuzzification module

It dissolves multiple degree ambiguous by putting raw fuzzy outputs into a composite numerical output. The defuzzify outcome is employed to restraint the consciousness level of human

In this part of the fuzzy solution for each output variable is defuzzification converted back to a classical number Fuzzy identification as an effective part for the measurement of uncertain nonlinear dynamic systems on the basis of measured input-output data.

The FIS Editor displays general information about a fuzzy inference system. There's a simple diagram at the top that shows the names of each input variable (EE, ET and EH) on the left, and those of each output variable (Consciousness Level) on the right. The sample membership functions shown in the boxes are just icons and do not depict the actual shapes of the membership functions (figure 8).

There are two distinct membership functions for the output which is consciousness level on the system: The Rule Viewer displays a roadmap of the whole fuzzy

inference process. It is based on the fuzzy inference diagram described in the previous section. The three plots across the top of the figure represent the antecedent and consequent of the first rule. Each rule is a row of plots, and each column is a variable. The rule numbers are displayed on the left of each row.

CONCLUSIONS

This fuzzy model of consciousness show that level of consciousness directly relates to the energy centres of the body. It is mostly depends on the energy at eye and throat centre. It can be also called fuzzy consciousness. We may conclude that from the above result the health care workers with high consciousness level will perform better than the health care workers with low consciousness level. There is no significant correlation between height, weight, age and performance. the correlation factors show that difference between chakras energy before and after work is highly correlated with performance of the worker and statistical analysis shows that deviation between before and after work is to be decrease due to achieve same environment during the work, also the difference in consciousness level before and after work at eye centre and throat centre both are correlated with experience of the worker in a particular organization.

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